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(54) **WIRELESS COMMUNICATION APPARATUS, WIRELESS COMMUNICATION METHOD, AND COMPUTER-READABLE RECORDING MEDIUM**

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See application file for complete search history.

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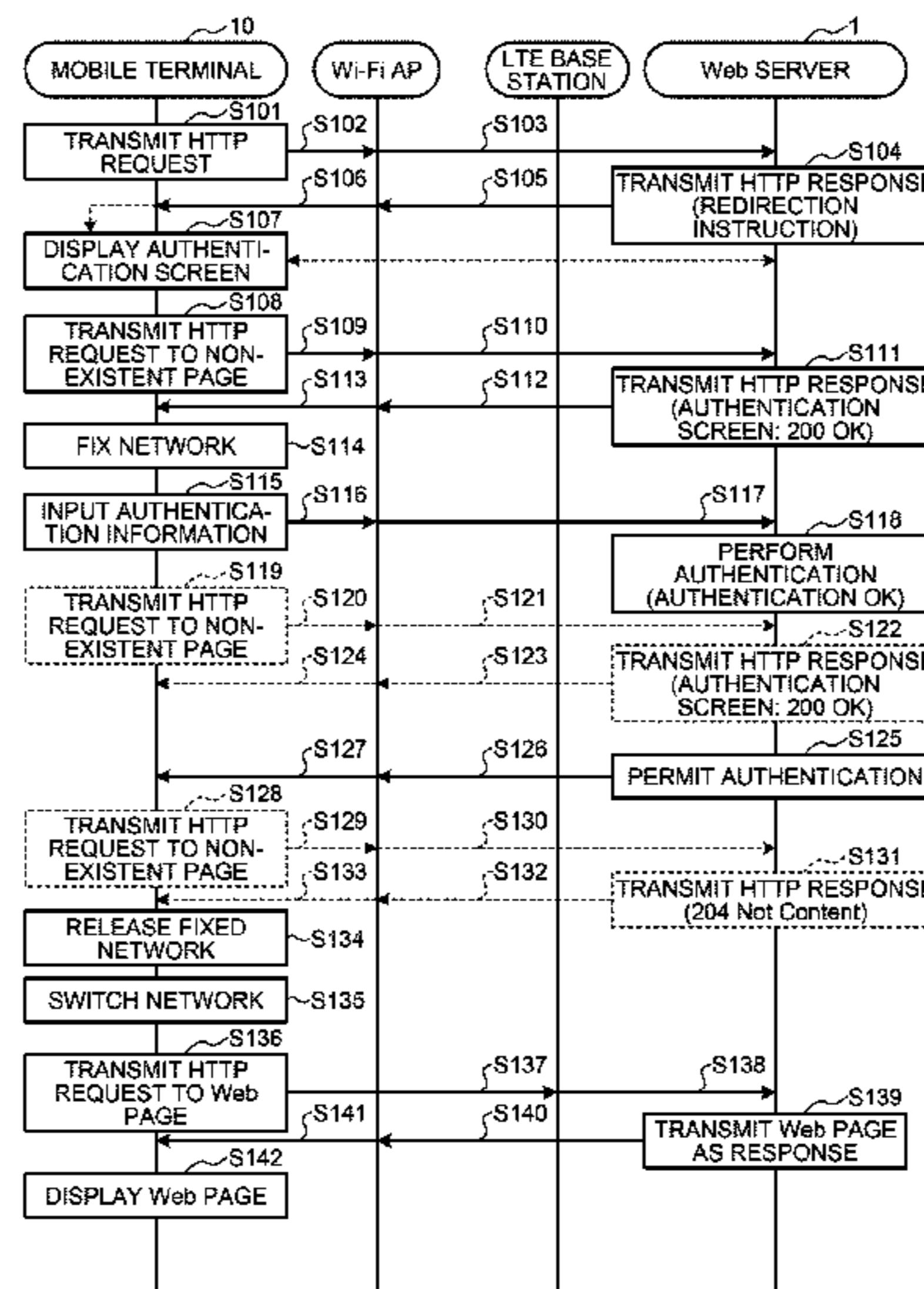
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(57) **ABSTRACT**

A mobile terminal allocates data to a first wireless interface using a first communication network and a second wireless interface using a second communication network and executes wireless communication. The mobile terminal executes Web access to a server using the first wireless interface and acquires an authentication screen from the server. The mobile terminal executes Web access to a predetermined Web page, which is confirmed not to exist in advance, using the first wireless interface after the Web access is executed performed, and suppresses the allocation of the data to the second wireless interface when the Web access succeeds.

5 Claims, 4 Drawing Sheets



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FIG. 1

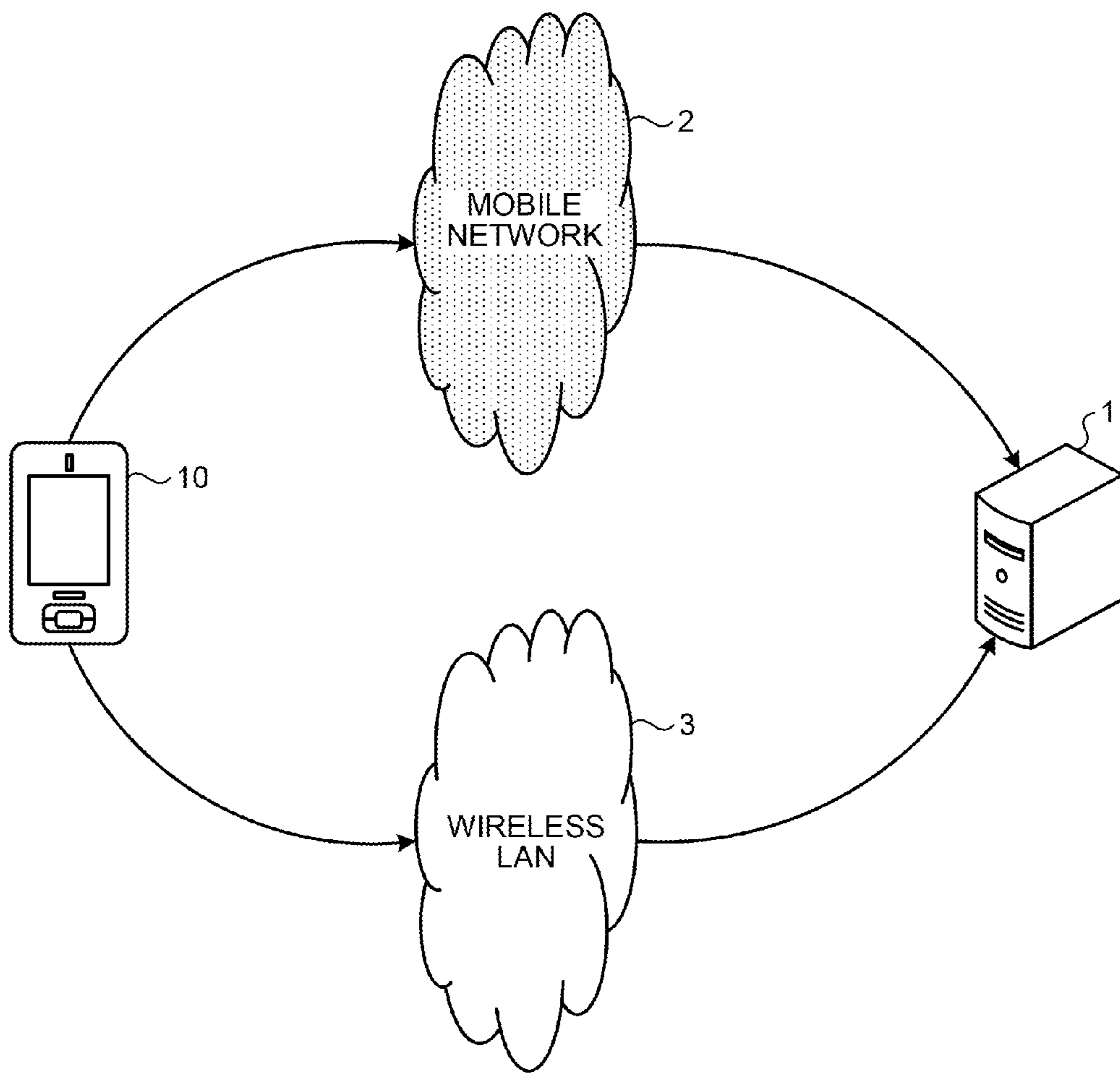


FIG.2

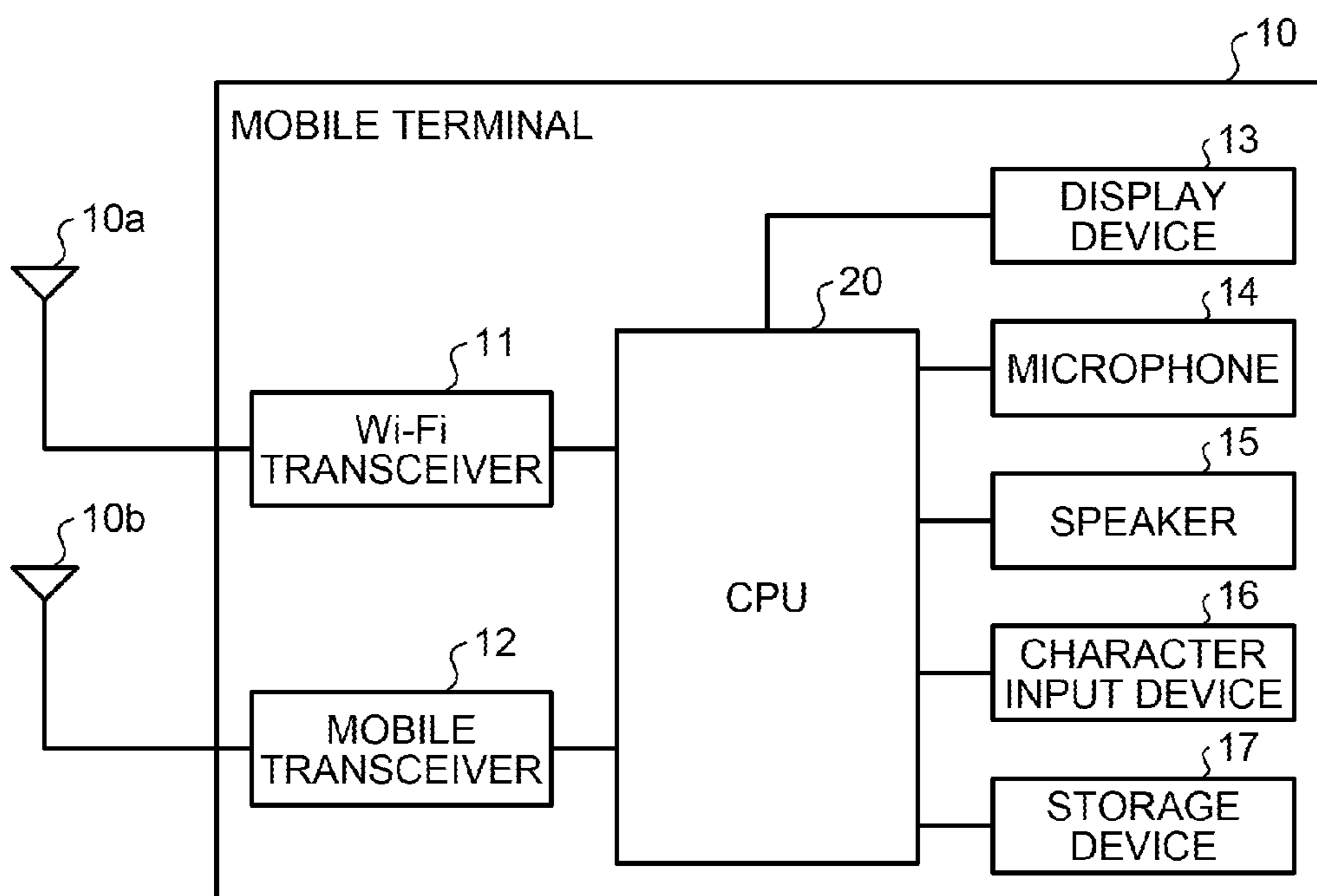


FIG.3

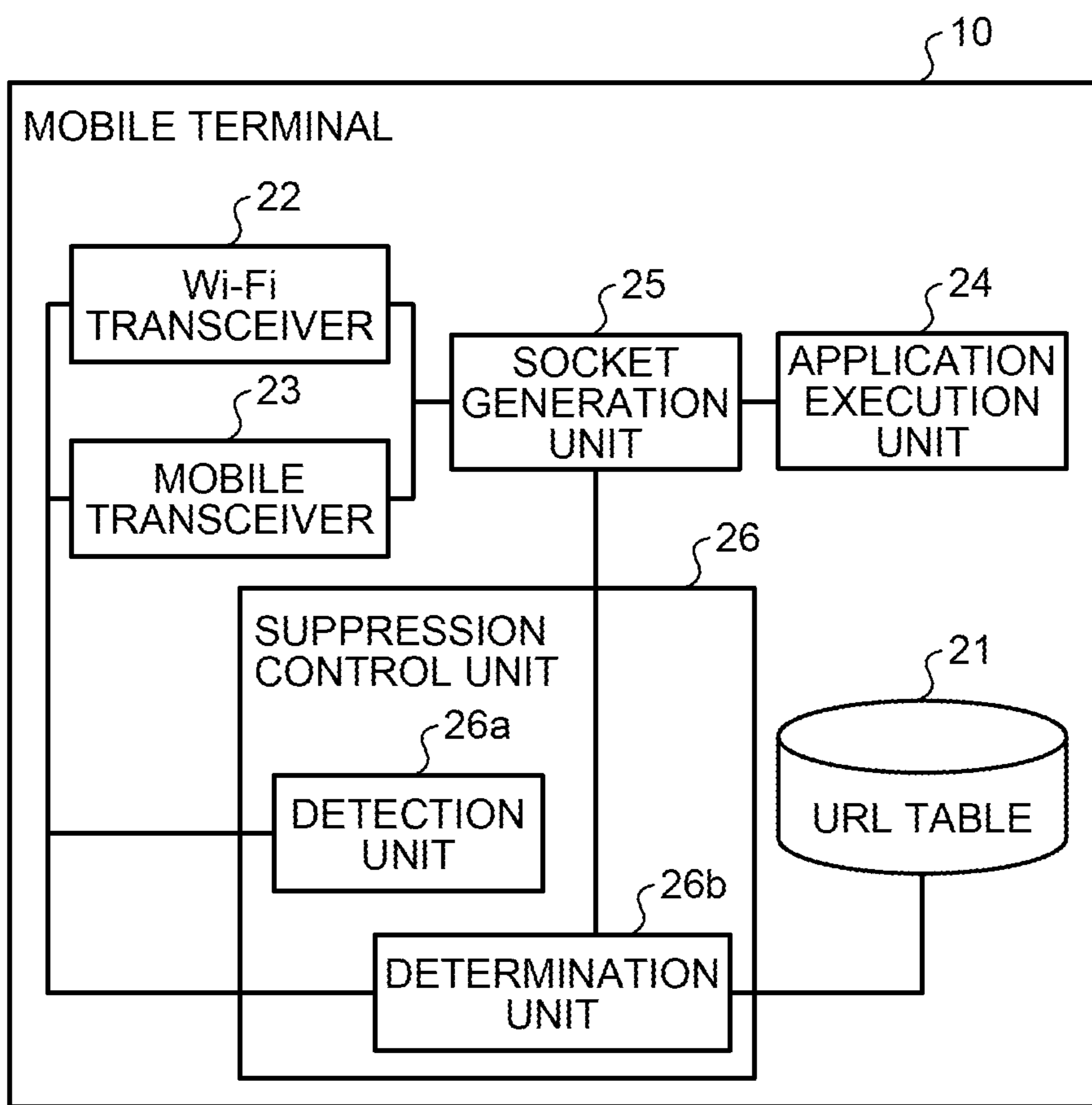
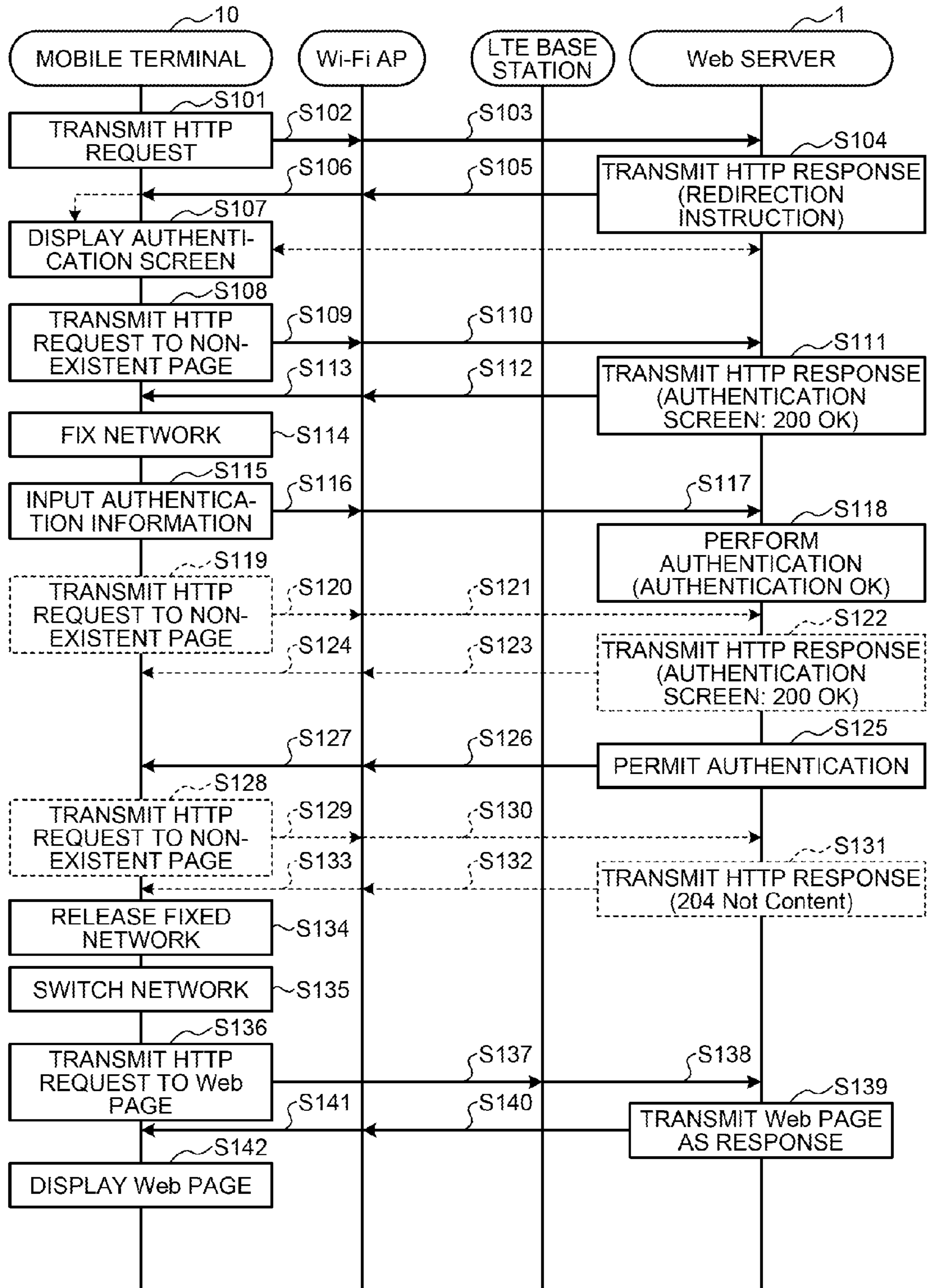


FIG.4



1**WIRELESS COMMUNICATION APPARATUS,
WIRELESS COMMUNICATION METHOD,
AND COMPUTER-READABLE RECORDING
MEDIUM****CROSS-REFERENCE TO RELATED
APPLICATION**

This application is based upon and claims the benefit of priority of the prior Japanese Patent Application No. 2014-079760, filed on Apr. 8, 2014, the entire contents of which are incorporated herein by reference.

FIELD

The embodiments discussed herein are related to a wireless communication apparatus, a wireless communication method, and a wireless communication program.

BACKGROUND

Mobile terminals, such as smart phones, have a communication means for connection to a mobile network, such as a long-term evolution (LTE) network or a 3rd generation (3G) network and a communication means for connection to a wireless local area network (LAN) such as a wireless fidelity (Wi-Fi) network.

In general, the mobile terminal is connected to the wireless LAN with high priority in an environment in which the mobile terminal can be connected to both the mobile network and the wireless LAN. When the wireless LAN is not available, the mobile terminal switches to the mobile network and performs communication. Some mobile terminals have a link aggregation function of performing communication using the mobile network and the wireless LAN at the same time. For example, the mobile terminal performs communication related to an application B using the wireless LAN while performing communication related to an application A using the mobile network.

Patent Document 1: Japanese Laid-open Patent Publication No. 2008-136150

Patent Document 2: Japanese Laid-open Patent Publication No. 2011-166251

However, in the above-mentioned technique, when the network is automatically switched during Web authentication which is user authentication for using Web services, the Web authentication fails.

For example, in recent years, the mobile terminal has used the Wi-Fi network and the mobile network at the same time, has allocated data to the Wi-Fi network and the mobile network, and has performed Web access. The mobile terminal accesses a Web server using the Wi-Fi network and acquires an authentication screen for using the Web services from the Web server. Then, the mobile terminal transmits authentication information as a response to the Web server using the LTE network since the quality of the Wi-Fi network deteriorates. Then, the Web server determines that Web access has been performed using a new communication network and transmits the authentication screen to the mobile terminal again.

As such, when the network used to request Web authentication is different from the network used for response, the authentication screen is retransmitted and an authentication process does not start, even though the authentication request and the authentication response are transmitted from the same mobile terminal.

2**SUMMARY**

According to an aspect of the embodiment, a wireless communication apparatus includes a memory; and a processor that is connected to the memory, wherein the processor executes a process. The process includes allocating data to a first wireless interface using a first communication network and a second wireless interface using a second communication network and first executing wireless communication; second executing Web access to a server using the first wireless interface and acquiring an authentication screen from the server; and third executing Web access to a predetermined Web page which is confirmed not to exist in advance, using the first wireless interface after the Web access is executed by the second executing, and suppressing the allocation of the data to the second wireless interface when the Web access succeeds by the third executing.

The object and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the claims.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are not restrictive of the invention.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a diagram illustrating an example of the overall structure of a system according to a first embodiment;

FIG. 2 is a diagram illustrating an example of the hardware configuration of a mobile terminal according to the first embodiment;

FIG. 3 is a functional block diagram illustrating the functional structure of the mobile terminal according to the first embodiment;

FIG. 4 is a sequence diagram illustrating the flow of a process according to the first embodiment.

DESCRIPTION OF EMBODIMENTS

Preferred Embodiments of the Present Invention will be explained with reference to accompanying drawings. The invention is not limited to the embodiments.

[a] First Embodiment**Overall Structure**

FIG. 1 is a diagram illustrating an example of the overall structure of a system according to a first embodiment. As illustrated in FIG. 1, in the system, a mobile terminal **10** and a Web server **1** are connected so as to communicate with each other through a mobile network **2** and a wireless LAN **3**.

An example of the mobile network **2** is an LTE network or a 3G network and an example of the wireless LAN **3** is a Wi-Fi network or a worldwide interoperability for microwave access (WiMAX) network. For example, the number of apparatuses is an illustrative example and is not particularly limited. In this embodiment, an example in which the Wi-Fi network and the LTE network are used will be described.

The Web server **1** is a server apparatus that provides Web services to the client and is managed by, for example, a mobile phone company. The Web server **1** performs user authentication for a client terminal and provides various Web services to the authenticated client terminal.

For example, when receiving Web access using the mobile network **2**, the Web server **1** determines that the client terminal, which is an access request source, is the authenticated user on the basis of the fact that only the subscriber can use the mobile network **2**. Then, the Web server **1** provides various Web services to the client terminal, without performing Web authentication.

When receiving Web access using the wireless LAN **3**, the Web server **1** authenticates the user of the client terminal, which is an access request source, on the basis of the fact that the unspecified user can use the wireless LAN **3**. Then, when the user is authenticated, the Web server **1** provides various Web services to the client terminal.

The mobile terminal **10** is a client terminal that executes applications to communicate with the Web server **1** and is, for example, a smart phone, a mobile phone, or a notebook personal computer. The mobile terminal **10** includes antennas corresponding to each communication network and can perform communication using the communication networks at the same time.

For example, the mobile terminal **10** determines the ratio of the Wi-Fi network to the LTE network to be 7:3 in an environment in which the quality of the Wi-Fi network is higher than the quality of the LTE network. In this case, the mobile terminal **10** transmits seven sockets through a Wi-Fi channel and transmits three sockets through an LTE channel among 10 sockets used by an application A.

That is, the mobile terminal **10** establishes a connection to the Wi-Fi network, using a Wi-Fi internet protocol (IP) address and a port number used by the application A, and the Wi-Fi IP address of the Web server **1** and the port number used by the application A. Then, the mobile terminal **10** opens the sockets and writes data to the sockets such that the Web server **1** reads the data. The Web server **1** returns a request from the mobile terminal **10** and the mobile terminal **10** receives data using the sockets. When the communication between the mobile terminal **10** and the Web server **1** is completed, the mobile terminal **10** closes the sockets. The mobile terminal **10** performs communication using seven Wi-Fi sockets among a total of 10 sockets to transmit data.

The mobile terminal **10** establishes a connection to the LTE network, using an LTE IP address and the port number used by the application A, and the LTE IP address of the Web server **1** and the port number used by the application A. Then, the mobile terminal **10** opens the sockets and writes data to the sockets such that the Web server **1** reads the data. The Web server **1** returns a request from the mobile terminal **10** and the mobile terminal **10** receives the data using the sockets. When the communication between the mobile terminal **10** and the Web server **1** is completed, the mobile terminal **10** closes the sockets. The mobile terminal **10** performs communication using three LTE sockets among a total of 10 sockets to transmit data.

In this state, the mobile terminal **10** allocates data to a first wireless interface using the Wi-Fi network and a second wireless interface using the LTE network and performs wireless communication. Then, the mobile terminal **10** performs Web access to the Web server **1** using the first wireless interface and acquires an authentication screen from the Web server **1**. Then, the mobile terminal **10** performs Web access to a non-existent Web page using the first wireless interface. When the access has succeeded, the mobile terminal **10** suppresses the allocation of data to the second wireless interface.

For example, after Web authentication using the Wi-Fi network starts, the mobile terminal **10** accesses a non-existent uniform resource locator (URL) and fixes the net-

work used to the Wi-Fi network while an access response, such as 200 OK, is being acquired. That is, when acquiring the Web authentication screen from the Web server **1** using the Wi-Fi network, the mobile terminal **10** uses the sockets allocated to the Wi-Fi network to communicate with the Web server **1**, regardless of the conditions of the network. As a result, the mobile terminal **10** can switch the network during Web authentication and prevent an authentication failure.

Hardware Configuration

FIG. **2** is a diagram illustrating an example of the hardware configuration of the mobile terminal according to the first embodiment. As illustrated in FIG. **2**, the mobile terminal **10** includes a Wi-Fi transceiver **11**, a mobile transceiver **12**, a display device **13**, a microphone **14**, a speaker **15**, a character input device **16**, a storage device **17**, and a central processing unit (CPU) **20**.

The Wi-Fi transceiver **11** performs communication through the wireless LAN **3**, such as a Wi-Fi network, using an antenna **10a**. A Wi-Fi IP address is set in the Wi-Fi transceiver **11**. The Wi-Fi transceiver **11** establishes a connection to the Web server **1**, using the IP address, and transmits and receives data.

The mobile transceiver **12** performs communication through the mobile network **2**, such as an LTE network, using an antenna **10b**. An LTE IP address is set in the mobile transceiver **12**. The mobile transceiver **12** establishes a connection to the Web server **1**, using the IP address, and transmits and receives data.

The display device **13** is, for example, a touch panel or a display and displays various kinds of information. The microphone **14** collects a voice and inputs the collected voice to the CPU **20**. The speaker **15** outputs the voice input from the CPU **20**.

The character input device **16** is, for example, a keyboard or a keyboard which is displayed on a touch panel, receives various inputs from the user, and outputs the inputs to the CPU **20**. The storage device **17** is, for example, a memory or a hard disk and stores, for example, the programs executed by the CPU **20**, the processing results which are generated by the programs executed by the CPU **20**, and various tables.

The CPU **20** is a processing unit which is in charge of all of the processes of the mobile terminal **10**. The CPU **20** reads a program from the storage device **17** and performs processes. For example, the CPU **20** operates a process that performs processing which will be described after FIG. **3**. In addition, two or more CPUs **20** may be provided.

Functional Structure

FIG. **3** is a functional block diagram illustrating the functional structure of the mobile terminal according to the first embodiment. As illustrated in FIG. **3**, the mobile terminal **10** includes a URL table **21**, a Wi-Fi transceiver **22**, a mobile transceiver **23**, an application execution unit **24**, a socket generation unit **25**, and a suppression control unit **26**.

The URL table **21** stores the URLs of non-existent Web pages. The stored URL may be a predetermined URL or a URL obtained by automatically changing the URL of the Web authentication screen designated by redirection according to a predetermined rule.

The Wi-Fi transceiver **22** is a processing unit that generates the sockets to be used for the Wi-Fi network and transmits and receives data using the Wi-Fi network. Specifically, the Wi-Fi transceiver **22** establishes a connection to the Web server **1** on the Wi-Fi network and transmits data to the Web server **1** using the socket.

For example, the Wi-Fi transceiver **22** writes data to the socket using the connection which is established with the

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Web server 1. The data is read by the Web server 1. The Web server 1 returns the request from the mobile terminal 10 and the mobile terminal 10 receives the data using the socket. When the communication between the mobile terminal 10 and the Web server 1 is completed, the Wi-Fi transceiver 22 closes the socket.

When the Web server 1 writes data to the socket, the Wi-Fi transceiver 22 reads the data from the socket, using the connection established with the Web server 1. In this way, the Wi-Fi transceiver 22 transmits and receives data using Wi-Fi socket communication.

The mobile transceiver 23 is a processing unit that generates the sockets to be used for the LTE network and transmits and receives data using the LTE network. Specifically, the mobile transceiver 23 establishes a connection to the Web server 1 on the LTE network and transmits data to the Web server 1 using the socket.

For example, the mobile transceiver 23 writes data to the socket using the connection established with the Web server 1 and the Web server 1 reads the data. The Web server 1 returns the request from the mobile terminal 10 and the mobile terminal 10 receives the data using the socket. When the communication between the mobile terminal 10 and the Web server 1 is completed, the mobile transceiver 23 closes the socket.

When the Web server 1 writes data to the socket, the mobile transceiver 23 reads the data from the socket, using the connection established with the Web server 1. In this way, the mobile transceiver 23 transmits and receives data using LTE socket communication.

The application execution unit 24 is a processing unit that executes applications. Specifically, the application execution unit 24 reads an application program desired by the user from, for example, the storage device 17, develops the program in the memory, and executes the application, in response to an instruction from the user.

For example, when a Web access request is received from the user, the application execution unit 24 performs Web access to the Web server 1 using the Wi-Fi transceiver 22 or the mobile transceiver 23. In this case, the socket generation unit 25 allocates the socket used for the Web access to any one of the networks. Then, when the Web access to the Web server 1 is performed using the mobile transceiver 23, the application execution unit 24 acquires the Web page which is desired by the user and displays, the Web page on, for example, a display.

On the other hand, when the Web access to the Web server 1 is performed using the Wi-Fi transceiver 22, the application execution unit 24 acquires the Web authentication screen and displays the Web authentication screen on, for example, the display. Then, the application execution unit 24 receives the user ID or the password which is input to the Web authentication screen by the user. Then, when authentication is permitted, the application execution unit 24 acquires the Web page which is desired by the user and displays, the Web page on, for example, the display.

The socket generation unit 25 is a processing unit that generates sockets. Specifically, the socket generation unit 25 determines a socket generation ratio on the basis of the quality of the Wi-Fi network and the quality of the LTE network and generates sockets at the determined ratio. Various methods can be used to determine the socket generation ratio. For example, a table which can uniquely determine the socket generation ratio on the basis of a combination of the quality of the Wi-Fi network and the quality of the LTE network can be used.

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For example, the socket generation unit 25 stores a table which specifies a unique ratio from the received signal strength indicator (RSSI) value of the Wi-Fi network and the link speed of the LTE network in, for example, a storage unit. Then, the socket generation unit 25 periodically acquires the RSSI value and the link speed and specifies the ratio to be "7:3". Then, the socket generation unit 25 generates sockets at the specified ratio, allocates communication to the Wi-Fi network and the LTE network, and performs communication using the Wi-Fi network and the LTE network at the same time.

The suppression control unit 26 is a processing unit that includes a detection unit 26a and a determination unit 26b and suppresses the allocation of the sockets using the detection unit 26a and the determination unit 26b.

The detection unit 26a is a processing unit that detects the acquisition of the Web authentication screen using the Web access with the Wi-Fi network. For example, the detection unit 26a monitors the Wi-Fi transceiver 22 and detects whether the Web authentication screen is received. Then, when detecting that the Web authentication screen is acquired through the Wi-Fi network, the detection unit 26a notifies the determination unit 26b that the Web authentication screen has been acquired.

The determination unit 26b is a processing unit that allocates the sockets to the mobile transceiver 23 when the detection unit 26a detects the acquisition of the Web authentication screen. Specifically, the determination unit 26b suppresses the allocation of the sockets to the LTE network and fixes communication to socket communication using the Wi-Fi network, regardless of the socket allocation ratio, for a period from the start of Web authentication using the Wi-Fi socket to the completion of the Web authentication.

For example, when the acquisition of the Web authentication screen is detected, the determination unit 26b attempts to access a non-existent Web page using the Wi-Fi network. When the access to the existent Web page has succeeded, the determination unit 26b outputs an instruction to suppress the allocation of the sockets to the mobile transceiver 23 to the socket generation unit 25. As a result, the mobile transceiver 23 suppresses the allocation of the socket to the mobile transceiver 23.

That is, the determination unit 26b suppresses the allocation of the sockets to the LTE network when receiving, for example, a message, such as 200 OK, even though the access to the non-existent Web page has succeeded. That is, when the Web authentication screen is transmitted as a response to the access to the non-existent Web page, the determination unit 26b determines that Web authentication is being performed, on the basis of the fact that the Web server 1 continuously transmits the Web authentication screen in response to the Web access until the Web authentication is permitted.

The determination unit 26b repeatedly performs the access to the non-existent Web page using the Wi-Fi network at a predetermined interval of, about, 5 ms. Then, the determination unit 26b suppresses the allocation of the socket to the LTE network when the Web access has succeeded and releases the suppression of the allocation of the socket to the LTE network when the Web access has failed.

That is, when the determination unit 26b performs Web access to the non-existent Web page using the Wi-Fi network and receives, for example, an error message, such as 204 Not Content, it starts the allocation of the sockets to the LTE network and resumes communication using the link aggregation function.

That is, the determination unit **26b** determines that the Web authentication has ended when it does not receive the Web authentication screen, but receives a response indicating that a Web page does not exist from the Web server **1** in response to the access to the non-existent Web page.

Flow of Process

FIG. **4** is a sequence diagram illustrating the flow of the process according to the first embodiment. The application execution unit **24** of the mobile terminal **10** transmits an HTTP request to the Web server **1** through a Wi-Fi access point (Wi-FiAP), using the sockets of the Wi-Fi transceiver **22** (step **S101** to step **S103**).

Then, the Web server **1** transmits an HTTP response including a Web authentication screen redirection instruction to the mobile terminal **10**, which is a Web access request source, since Web access using the Wi-Fi network is performed (step **S104** to step **S106**). Then, the application execution unit **24** of the mobile terminal **10** performs redirection and acquires the Web authentication screen from the Web server **1** (step **S107**).

When the acquisition of the Web authentication screen is detected, the suppression control unit **26** of the mobile terminal **10** transmits an HTTP request for a non-existent Web page to the Web server **1** through the Wi-FiAP (step **S108** to step **S110**).

Then, the Web server **1** determines that the mobile terminal **10** which has not passed Web authentication performs the Web access and returns an authentication screen, such as 200 OK, as an HTTP request to the mobile terminal **10** (step **S111** to step **S113**).

As a result, the suppression control unit **26** of the mobile terminal **10** outputs an instruction to suppress the allocation of the sockets to the mobile transceiver **23** to the socket generation unit **25** and fixes the communication network to the Wi-Fi network (step **S114**). As a result, the mobile terminal **10** performs data communication using only the sockets generated for the Wi-Fi transceiver **22**. In addition, the mobile terminal **10** newly generates only the sockets for the Wi-Fi transceiver **22** during suppression control.

Then, the application execution unit **24** of the mobile terminal **10** inputs the user ID or the password received from the user to the Web authentication screen acquired in step **S107** and transmits the Web authentication screen to the Web server **1** (step **S115** to step **S117**). Then, the Web server **1** performs authentication and determines that authentication has been permitted (step **S118**).

In the background of the Web authentication, the suppression control unit **26** of the mobile terminal **10** transmits an HTTP request for a non-existent Web page to the Web server **1** through the Wi-FiAP and acquires 200 OK (authentication screen) (step **S119** to step **S124**). As a result, the mobile terminal **10** maintains the suppression of the allocation of the socket to the LTE network.

Then, the Web server **1** transmits a response indicating that Web authentication has been permitted to the mobile terminal **10** through the Wi-FiAP (step **S125** to step **S127**).

In the background of the permission response, the suppression control unit **26** of the mobile terminal **10** transmits an HTTP request for a non-existent Web page to the Web server **1** through the Wi-FiAP (step **S128** to step **S130**).

Then, the Web server **1** determines whether the mobile terminal **10** which has passed Web authentication performs Web access and transmits an HTTP request, such as a message indicating that a Web page does not exist, as a response to the mobile terminal **10** (step **S131** to step **S133**).

As a result, the suppression control unit **26** of the mobile terminal **10** outputs an instruction to release the suppression

of the allocation of the sockets to the mobile transceiver **23** to the socket generation unit **25** and resumes the link aggregation function (step **S134**).

Then, the socket generation unit **25** of the mobile terminal **10** switches the network such that the ratio of the sockets allocated to the LTE network increases with the deterioration of the quality of the Wi-Fi network (step **S135**).

Then, the application execution unit **24** of the mobile terminal **10** transmits an HTTP request for a desired Web page to the Web server **1** (step **S136** to step **S138**). Specifically, the application execution unit **24** transmits the HTTP request to the Web server **1** through an LTE base station, using the sockets of the mobile transceiver **23**.

Then, the Web server **1** transmits the requested Web page to the mobile terminal **10**, which is a Web access request source, since the mobile terminal **10** which has passed the Web authentication performs the Web access (step **S139** to step **S141**). As a result, the mobile terminal **10** can acquire the desired Web page (step **S142**).

Effect

As such, in the general Web access, after the mobile terminal is connected to the Wi-Fi access point, an authentication page is displayed first. At that time, when authentication is not executed and the mobile terminal is connected to a non-existent page, a message "204 No Content" is returned. Therefore, when the mobile terminal **10** is redirected to the authentication screen and a message 200 OK is returned, the mobile terminal **10** determines that the page has changed to a Web authentication page and displays the authentication screen in a state in which Web authentication has not been performed. During the authentication process, the mobile terminal **10** temporarily fixes the internal state to one communication network in a simultaneous connection operation using link aggregation.

During the Web authentication process, the mobile terminal **10** is periodically connected to the non-existent page and determines that the authentication process has been completed when the message "204 No Content" is returned. Then, the mobile terminal **10** returns the internal state to the state in which it is connected to the Wi-Fi network and the LTE network at the same time and then continuously performs the link aggregation operation.

Therefore, when the mobile terminal **10** performs a simultaneous connection to the Wi-Fi network and the LTE3G network using the link aggregation function, it can normally perform the Web authentication process in the simultaneous connection state during Web authentication using the Wi-Fi network.

[b] Second Embodiment

The first embodiment of the invention has been described above. However, the invention is not limited to the above-described embodiment, but various modifications and changes of the invention can be made.

Non-Existent Web Page

For example, when performing Web access to the non-existent Web page, the mobile terminal **10** can check whether a Web page does not really exist using the LTE network once. In this way, since the mobile terminal **10** can check whether a Web page does not really exist, it is possible to accurately determine the time when the use of the LTE network is suppressed.

Suppression Control

For example, the mobile terminal **10** can suppress the link aggregation function for data related to Web access. Specifically, when data communication is performed while the

allocation of the sockets to the LTE network is suppressed, the mobile terminal 10 performs control such that data is transmitted using the Wi-Fi network when the type of data is Web access. The mobile terminal 10 can transmit data other than the data related to Web access using the general link aggregation function.

Structure of System and Others

Each structure of the apparatus illustrated in the drawings is not always the physical structure illustrated in the drawings. That is, the components can be dispersed or integrated in an arbitrary unit. In addition, all or some of the processing functions of each apparatus can be implemented by a CPU and the program which is analyzed and executed by the CPU or they can be implemented as hardware by a wired logic.

In addition, among the processes described in this embodiment, all or some of the processes that are automatically performed may be manually performed. Alternatively, all or some of the processes that are manually performed may be automatically performed by a known method. The processing procedure, the control procedure, the specific names, and information including various kinds of data and parameters which are described in the specification and the drawings may be arbitrarily changed unless otherwise specified.

The mobile terminal 10 according to the above-described embodiment can read a wireless communication control program and execute the wireless communication control program to implement the same functions as those in the process described with reference to, for example, FIG. 3. For example, the mobile terminal 10 develops, in the memory, a program which has the same functions as the Wi-Fi transceiver 22, the mobile transceiver 23, the application execution unit 24, the socket generation unit 25, and the suppression control unit 26. Then, the mobile terminal 10 executes the program which implements the same processes as the Wi-Fi transceiver 22, the mobile transceiver 23, the application execution unit 24, the socket generation unit 25, and the suppression control unit 26 to perform the same processes as those in the above-described embodiment.

The program can be distributed through a network such as the Internet. In addition, the program can be recorded on a computer-readable recording medium, such as a hard disk, a flexible disk (FD), a CD-ROM, an MO, or a DVD and the computer can read the program from the recording medium and execute the program.

According to the embodiment, it is possible to prevent the failure of an authentication process.

All examples and conditional language recited herein are intended for pedagogical purposes of aiding the reader in understanding the invention and the concepts contributed by the inventor to further the art, and are not to be construed as limitations to such specifically recited examples and conditions, nor does the organization of such examples in the specification relate to a showing of the superiority and inferiority of the invention. Although the embodiments of the present invention have been described in detail, it should be understood that the various changes, substitutions, and alterations could be made hereto without departing from the spirit and scope of the invention.

What is claimed is:

1. A wireless communication apparatus comprising:
 - a memory; and
 - a processor that is connected to the memory, wherein the processor executes a process including:
 - allocating data to a first wireless interface using a first communication network and a second wireless interface using a second communication network and first

- executing wireless communication through both of the first communication network and the second communication network simultaneously;
 - second executing Web access to a server using the first wireless interface and acquiring an authentication screen from the server; and
 - attempting to execute Web access to a predetermined non-existent Web page, using the first wireless interface after the Web access is executed by the second executing, and suppressing the allocation of the data to the second wireless interface until the Web access to the predetermined non-existent Web page fails by the attempting, while maintaining both of a connection through the first communication network and a connection through the second communication network.
2. The wireless communication apparatus according to claim 1,
 - wherein the acquiring includes acquiring the authentication screen in response to redirection from the server through the first communication network, and when the Web access has succeeded in response to the redirection from the server through the first communication network, the suppressing includes suppressing the allocation of the data to the second communication network.
 3. The wireless communication apparatus according to claim 1,
 - wherein the suppressing includes executing the Web access to the predetermined Web page at a predetermined interval after the Web access is executed by the second executing, and suppressing the allocation of the data to the second communication network while the Web access to the predetermined Web page has succeeded.
 4. A wireless communication method comprising:
 - allocating data to a first wireless interface using a first communication network and a second wireless interface using a second communication network and executing wireless communication through both of the first communication network and the second communication network simultaneously, using a processor;
 - executing Web access to a server using the first wireless interface and acquiring an authentication screen from the server, using a processor; and
 - attempting to execute Web access to a predetermined non-existent Web page, using the first wireless interface after the Web access is executed, and suppressing the allocation of the data to the second wireless interface until the Web access to the predetermined non-existent Web page fails, while maintaining both of a connection through the first communication network and a connection through the second communication network, using a processor.
 5. A non-transitory computer-readable recording medium having stored a wireless communication program causing a computer to execute a process comprising:
 - allocating data to a first wireless interface using a first communication network and a second wireless interface using a second communication network and executing wireless communication through both of the first communication network and the second communication network simultaneously;
 - executing Web access to a server using the first wireless interface and acquiring an authentication screen from the server; and

attempting to execute Web access to a predetermined
non-existent Web page, using the first wireless interface
after the Web access is executed, and suppressing the
allocation of the data to the second wireless interface
until the Web access to the predetermined non-existent 5
Web fails, while maintaining both of a connection
through the first communication network and a con-
nection through the second communication network.

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